RUDN Journal of Economics
Вестник Российского университета дружбы народов.
Серия: Экономика

ISSN 2313-2329 (Print); ISSN 2408-8986 (Online)
2024 Vol. 32 No. 1 154–169
http://journals.rudn.ru/economics

ИННОВАЦИИ В СОВРЕМЕННОЙ ЭКОНОМИКЕ

INNOVATIONS IN THE MODERN ECONOMY

DOI: 10.22363/2313-2329-2024-32-1-154-169
EDN: SQACMC
UDC 338.4

Research article / Научная статья

The USA — China robotics competition: Leading the race in innovation and global power

Marina S. Reshetnikova ✉, Svetlana S. Tretyakova

RUDN University,
6 Miklukho-Maklaya St, Moscow, 117198, Russian Federation
✉ reshetnikova_ms@pfur.ru

Abstract. The International Federation of Robots claims that the number of robots being produced today is at an all-time high, particularly in sectors like electronics and the automotive industry. Considering this, as artificial intelligence (AI) becomes more and more popular, it is imperative to study the robotics market, particularly in the nations that are major players in it. Robots are now integrated into all industries, especially automotive and electronics. The need for modernization and increasing competition are pushing countries to automate production and improve business processes; the United States and China have achieved the greatest success in this. According to the authors, it is China that will succeed in the industrial robotics market by introducing "smart manufacturing" and "smart factories." In addition, there is now a growing trend towards creating robots that interact with people: the development of technology, the emergence of artificial intelligence, as well as human acceptance of the robot — all this contributes to the introduction of robots into our lives. Thus, according to the authors, it is the United States that has achieved the greatest success in the field of introducing service robots responsible for interaction with humans. The evolution of the robotics industry in the two major market participants — China and the United States — is analyzed. The study analyzes the industries in both countries to pinpoint development areas and reviews government initiatives that support business growth in both China and the United States.

Keywords: robotics, USA, China, service robotics, industrial robotics, R&D

Article history: received October 12, 2023; revised November 18, 2023; accepted December 10, 2023.

For citation: Reshetnikova, M.S., & Tretyakova, S.S. (2024). The USA — China robotics competition: Leading the race in innovation and global power. *RUDN Journal of Economics, 32*(1), 154–169. https://doi.org/10.22363/2313-2329-2024-32-1-154-169

Acknowledgements. This paper has been supported by the RUDN University Strategic Academic Leadership Program

Глобальное соперничество: США и Китай в борьбе за лидерство в области роботизации и технологий

М.С. Решетникова ✉, С.С. Третьякова

Российский университет дружбы народов,
Российская Федерация, 117198, Москва, ул. Миклухо-Маклая, д. 6

✉ reshetnikova_ms@pfur.ru

Аннотация. По данным Международной федерации роботов, на сегодняшний день мы наблюдаем рекордную концентрацию роботов на производстве, в особенности в таких отраслях, как автомобилестроение и электроника. С учётом набирающей популярности искусственного интеллекта очевидна необходимость изучения отрасли робототехники. Роботы интегрированы во все отрасли промышленности, в особенности такие, как автомобилестроение и электроника. Необходимость модернизации и возрастающая конкуренция подталкивают страны к автоматизации производства и совершенствованию бизнес-процессов, наибольших успехов в этом достигли США и Китай. По мнению авторов, именно Китай преуспеет на рынке промышленных роботов, внедрив «умное производство» и «умные заводы». Помимо этого сейчас растет тренд на создание роботов, взаимодействующих с людьми: развитие технологий, появление искусственного интеллекта, а также принятие человеком робота — все это способствует внедрению роботов в нашу жизнь. Так, по мнению авторов, именно США достигли наибольшего успеха в области внедрения сервисных роботов, отвечающих за взаимодействие с человеком. Приведен анализ отрасли развития отрасли робототехники в странах — ключевых игроках рынка: США и Китая. В работе сделана декомпозиция отрасли в этих странах для определения зон — точек роста, выделены государственные проекты, способствующие росту в Китае и в США.

Ключевые слова: роботизация, США, Китай, промышленная робототехника, сервисная робототехника, НИОКР

История статьи: поступила в редакцию 12 октября 2023 г., проверена 18 ноября 2023 г., принята к публикации 10 декабря 2023 г.

Для цитирования: *Reshetnikova M.S., Tretyakova S.S.* The USA — China robotics competition: Leading the race in innovation and global power // Вестник Российского университета дружбы народов. Серия: Экономика. 2024. Т. 32. № 1. С. 154–169. https://doi.org/10.22363/2313-2329-2024-32-1-154-169

Благодарности. Статья подготовлена при финансовой поддержке экономического факультета РУДН.

Introduction

Today the word "robot" has come into usage, but it first appeared not so long ago, particularly in 1920 in the book "Rossumovi univerzální roboti (R.U.R)" by the Czech writer Karel Capek (Čapek, 2023). In the past, a robot was thought of as an artificially formed human whose labor was utilized in heavy industries. As for now, a robot is an automated device that carries out different mechanical tasks in compliance with an embedded software.

The issue of the study is relevant since robots are becoming more and more prevalent in contemporary industry. The International Federation of Robots states that there is a record concentration of robots in production today, particularly in sectors like electronics and automotive.[1] We therefore need to investigate and study this sector, particularly countries that account for a large portion of the market. The study's objective is to forecast and analyze the robotics markets in China and the United States. Main aspects of the study include the following issues:

1. Describe the robotics industry: review the market, identify its key players, consider the strategies of the United States and China in the industry.
2. Identify factors affecting the industry.

The study employed a variety of research techniques, including mathematical modeling, informational, and analytical techniques.

Results

Top countries in the robotics sector: The USA and China's relative positions

The number of robot installations has been increasing gradually since 2017 (Figure 1). This indicates that the robotics market is expanding.

From 2016 to 2022, the US robotics industry's revenue as a percentage of global revenue ranged from 18 to 20 %. It is also important to note that, starting in 2020, the US robotics sector's growth rate outpaced the global robotics industry.

China's revenue varies from 15 % in 2016 to 18 % in 2022 as a percentage of the global total; the industry is growing faster than the global average starting in 2018 and continuing until 2021, when the peak was attained (Figure 2).

Consequently, the two economies account for more than 20 % of global income, demonstrating that both the US and China are gradually raising their production levels (Feenstra & Sasahara, 2018). From 2016 to 2022, the robotics industry's five largest countries by revenue were South Korea, Japan, China, Germany, and the United States. China, meantime, has become the world's greatest competitor to the United States, which has been leading the world for the past seven years, with a steady growth rate of 7–15 % between 2017 and 2022 (Reshetnikova & Pugacheva, 2022) (Figure 3).

[1] One million robots work in car industry worldwide — New record. *IFR Press Room — 2023.* Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/one-million-robots-work-in-car-industry-worldwide-new-record.

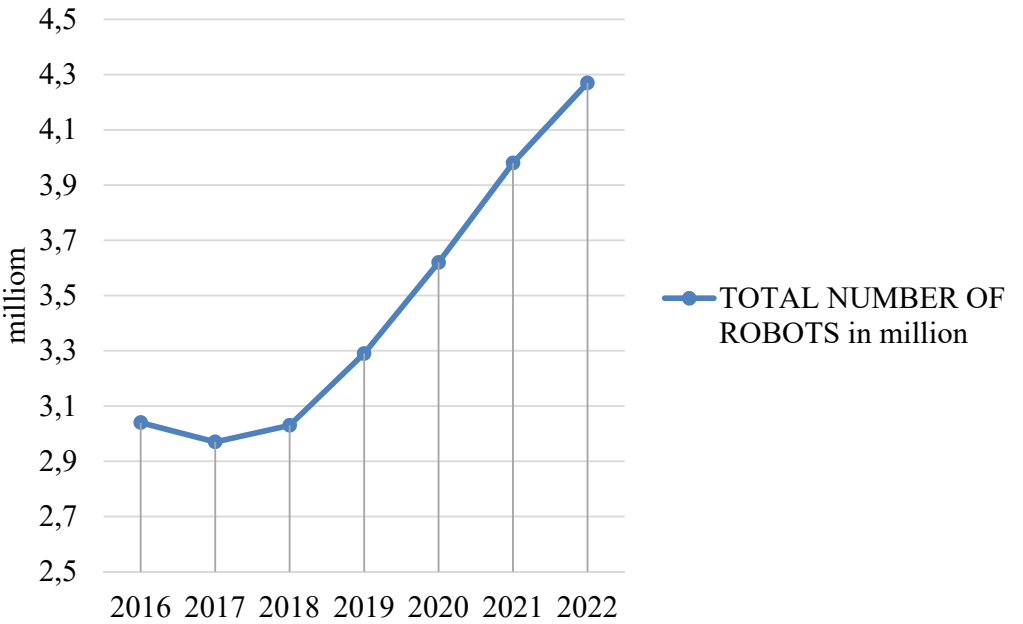

Figure 1. Number of robot installations in the world 2016–2022, million

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

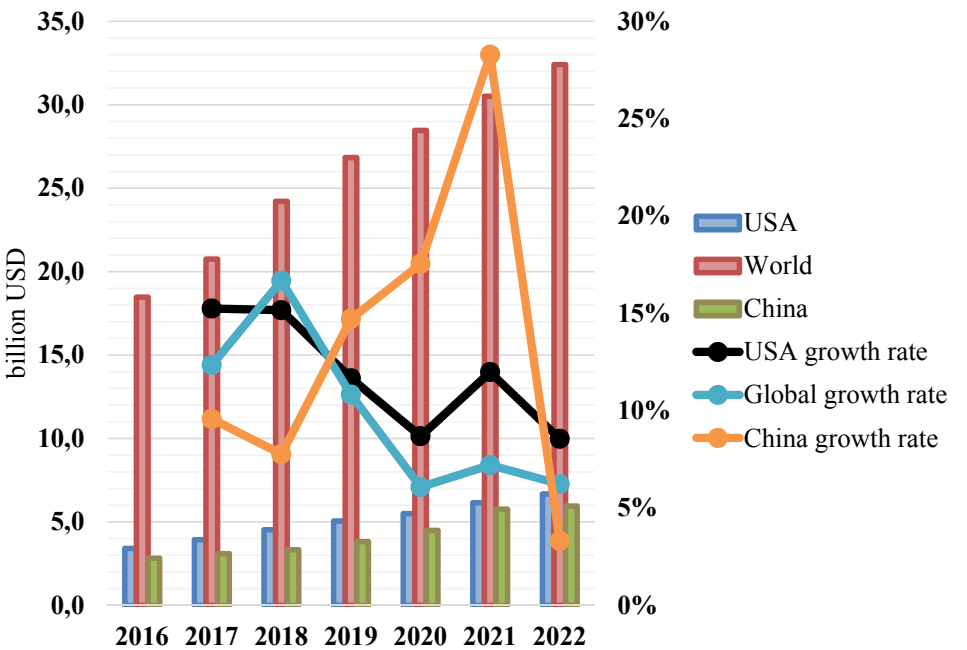

Figure 2. Global robotics industry revenue, broken down by US and Chinese, from 2016 to 2022, expressed in billion USD

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

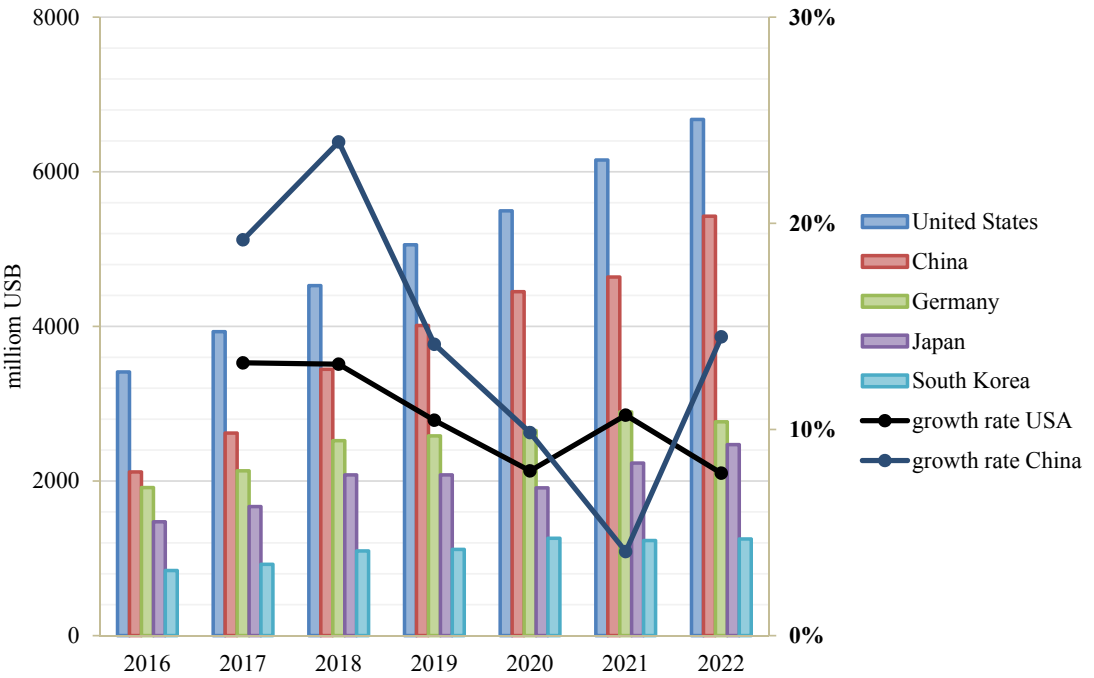

Figure 3. A comparison of the robotics industry's top 5 revenue earners from 2016 to 2022, expressed in US dollars

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

For this reason, the USA and China are actively competing in the robot industry to be deemed "the most technologically advanced country" (Zhao, 2019). Next, we'll take a closer look at each nation's areas of expertise and how those helped them to get these results.

Industrial robotics in China and the USA

The field of robotics known as industrial robotics focuses on automating production processes by building robots for use in manufacturing. Industrial robotics is subdivided into robots for the automotive, chemical, food, electronics, and metallurgical industries, among other industries (Hägele et al., 2016).

When we compare the positions of the USA and China in the industrial robotics industry, we can observe that China leads in terms of revenue, while the USA comes in fourth, trailing only Japan and Germany. It is reasonable to conclude that this situation resulted from China's aggressive industrial modernization (Reshetnikova, 2020) while the US attempted to shift its polluting output to developing countries (Montgomery & Yoshihara, 2022).

It is important to mention that the United States' share of the global revenue generated by the sale of industrial robots ranges from 14 % (2016) to 8 % (2023), with the growth rate of this revenue nearly matching the global rate. China's share of global revenue will drop from 28 % in 2016 to 18 % in 2022 (Figure 4).

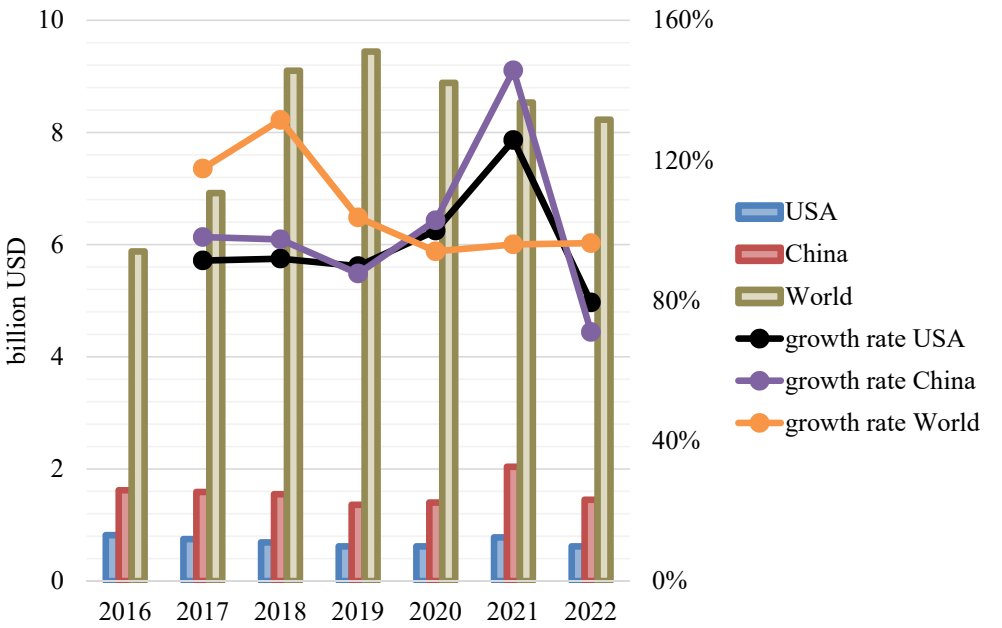

Figure 4. Industrial robotics industry's global revenue from 2016 to 2022 compared to figures from the US and China, US dollars, billion

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Analysis of industrial robot segments in China

The number of installations of new robots in China is not characterized by stable growth, but despite this, it continues to remain at a high level (Figure 5).

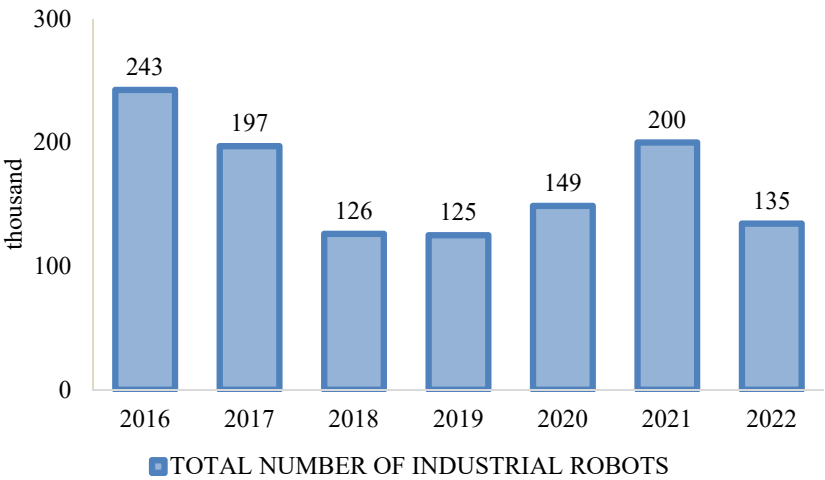

Figure 5. China's industrial robot installations from 2016 to 2022 in thousand

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Considering the most profitable segments of industrial robotics in China, we can highlight the electronics industry, as it is the most profitable, followed by metallurgical, automotive, and chemical industries (Figure 6).

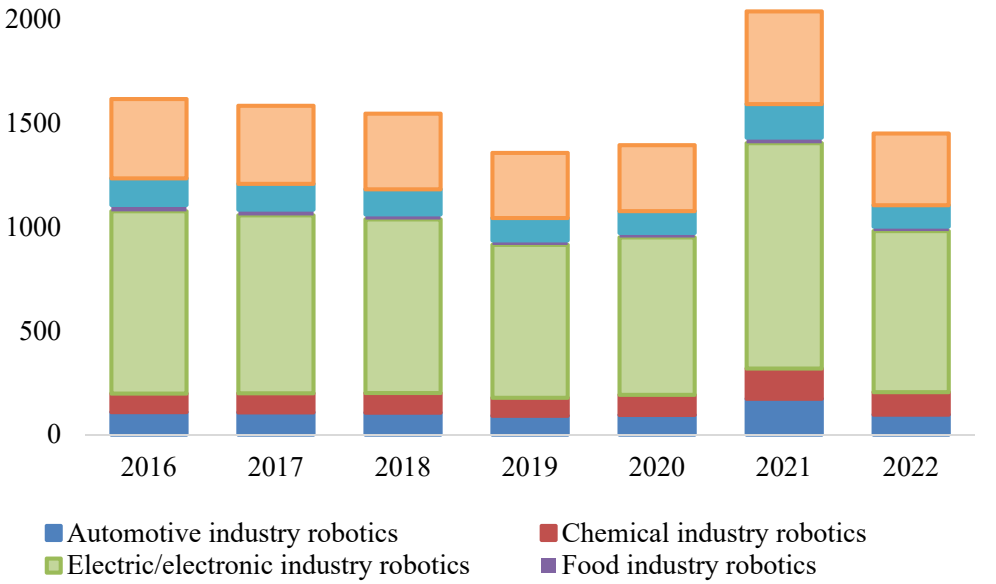

Figure 6. Industrial robotics revenue in China by segment for 2016–2022, USD million

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Considering the dynamics of revenue, it can be noted that all industries repeat the general trend: a decrease from 2017 to 2019, an increase from 2019 to 2021, and a sharp decrease in 2022. But the automobile sector stands out. It soared at an astounding 84 % growth rate in 2021, but it is already seeing a significant decrease in 2022 (Cheng et al., 2019).

Thus, China actively receives the greatest income from industrial robotics in the electronics industry sub-industry; the development of the automotive and metallurgical industries also has a significant impact on the development of the industry. Revenue dynamics are unstable, presumably market fluctuations are associated with the COVID-19, which has had an impact on heavy industry; market growth during these periods is associated with the increased need for production automation.

Analysis of industrial robot segments in the USA

Let's take a closer look at the US industrial robotics market. From 2016 to 2022, the industrial robotics market in the United States has seen a slight increase in the number of robot installations; the absolute increase in robots in 2022 compared to 2016 was 1,36 thousand robots (Figure 7).

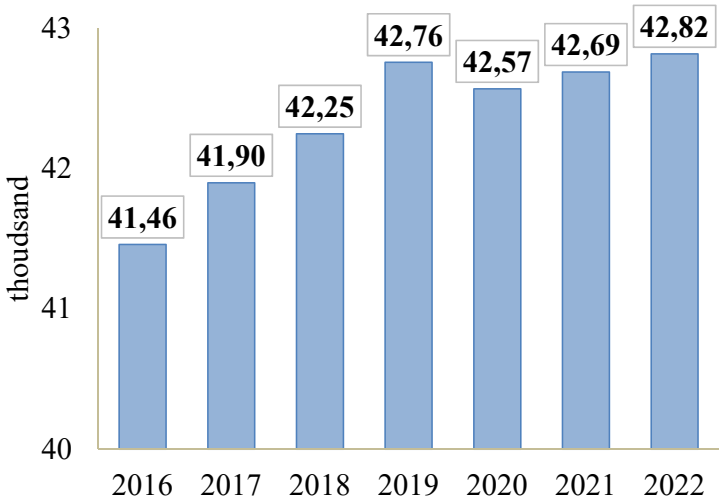

Figure 7. Number of new installations of industrial robots in the US 2016–2022, thousand

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

The analysis of US industrial robotics market showed that the highest income in 2016–2022 comes from segments such as the electronic and automotive robotics industries, while the food and metallurgical industries turned out to be the least profitable (Figure 8).

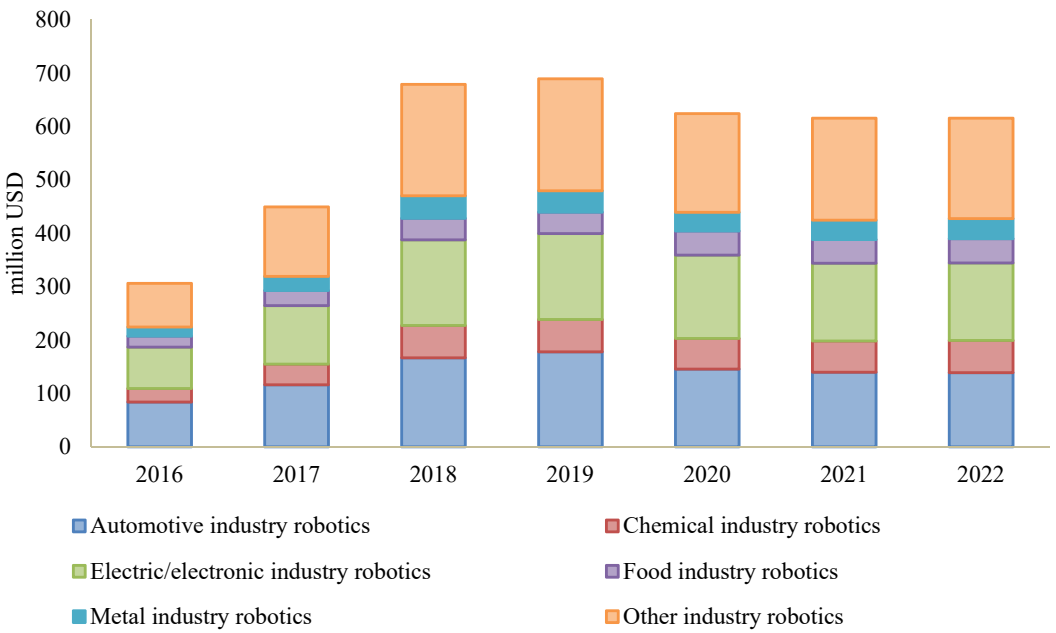

Figure 8. US Industrial Robotics Revenue by Segment, 2016–2022, million US dollars

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Nonetheless, a thorough analysis of revenue dynamics in different segments reveals a notable reduction in revenue growth rates since 2018, affecting all business sectors. Industries including the food, chemical, and metallurgical sectors all had negative growth rates in 2019; by 2020, all sectors had negative growth rates, with the food sector having the highest growth rate at 13.2 %; by 2022, the food, chemical, and metallurgical sectors had growth rates; growth rates in the electronics and automotive sectors remained negative (Figure 9).

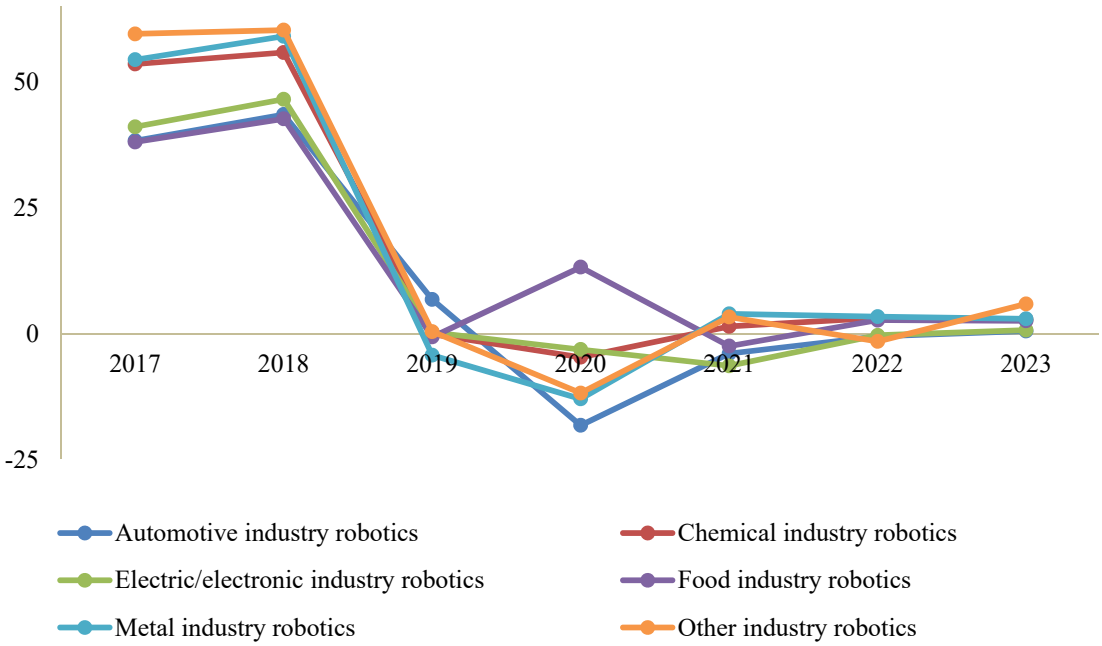

Figure 9. Change in US industrial robotics revenue by segment, percentage, 2017–2022

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

As a result, the US industrial sector is still making significant investments in robotics and automation. The primary driver of this process is the growing trend towards production automation; the use of robots in the manufacturing process can boost US industry's competitiveness internationally, retain domestic production, and even bring back country-outsourced production (Christensen et al., 2021).

Service robotics in the USA and China

From 2016 to 2023, the United States leads the service robotics market, outpacing China, Germany, Japan, and the United Kingdom (Figure 10).

When it comes to the service robotics market, it is important to remember that the US accounts for 25 % of the global market volume, the growth rate of revenue from service robotics sales also aligns with the global market, and China's growth rate surpasses that of the USA, but its revenue volume only accounts for 18 % of the global market (Figure 11).

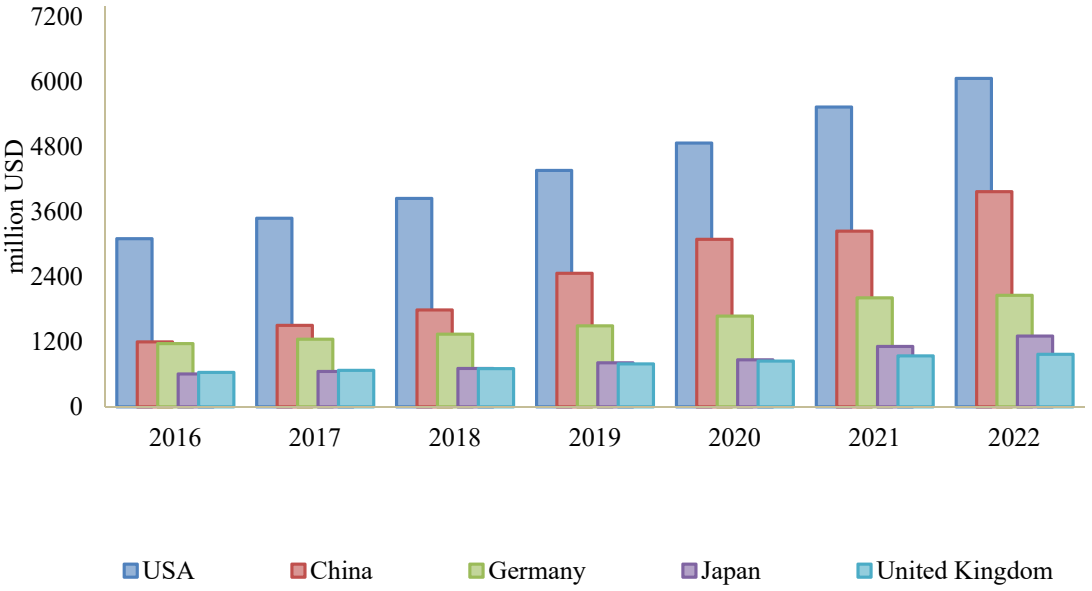

Figure 10. Comparison of the top 5 leaders in terms of revenue in the service robotics sector 2016–2022, million US dollars

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

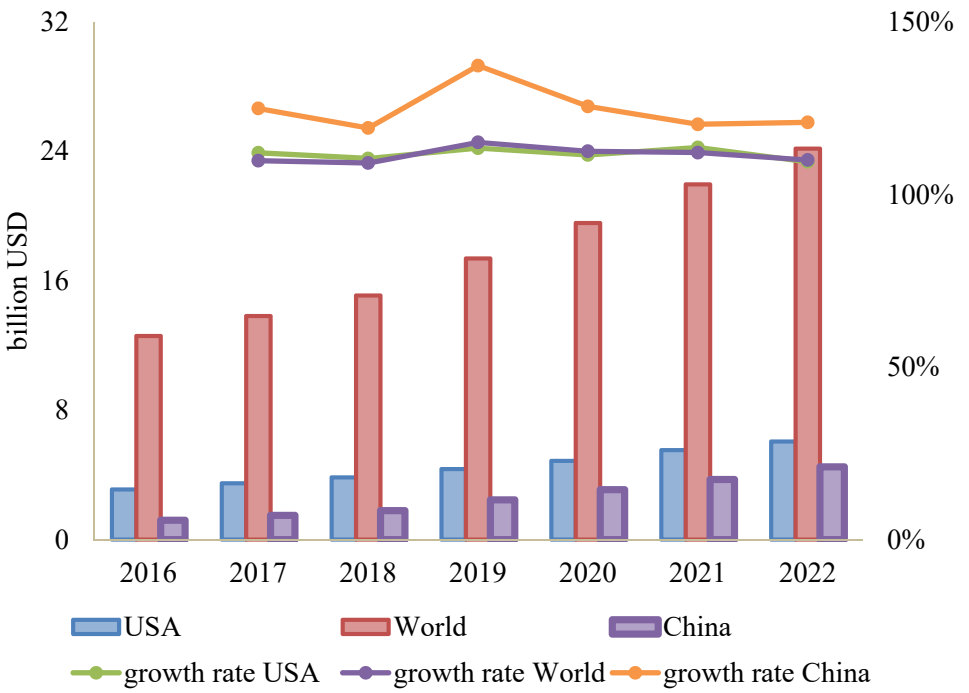

Figure 11. Comparison of global revenue with US and Chinese revenue in the service robotics industry 2016–2022, billion US dollars

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Thus, the absolute leader in the service robotics market is the United States, but China is also among the top 5 leading countries, remaining the main competitor of the United States (Gonzalez-Aguirre et al., 2021).

The US service robotics business is expanding (Merdin-Uygur & Ozturkcan, 2023). The absolute increase from 2016 to 2022 was 0,2 million robots. According to the income generated by the service robotics sectors, the consumer service segment made the most money in 2016, but from 2017 onward, the commercial service robotics segment's revenue took the lead, continuing to do so until 2022.

Considering the dynamics of the segments, it can be noted that the negative growth rate in the consumer service robotics industry in 2021, presumably associated with the COVID-19 epidemic, and on the contrary, the growth rate in the commercial service robotics segment, in 2021 the growth rate was 26,8 %, which is almost twice as much as in the previous year (Figure 12).

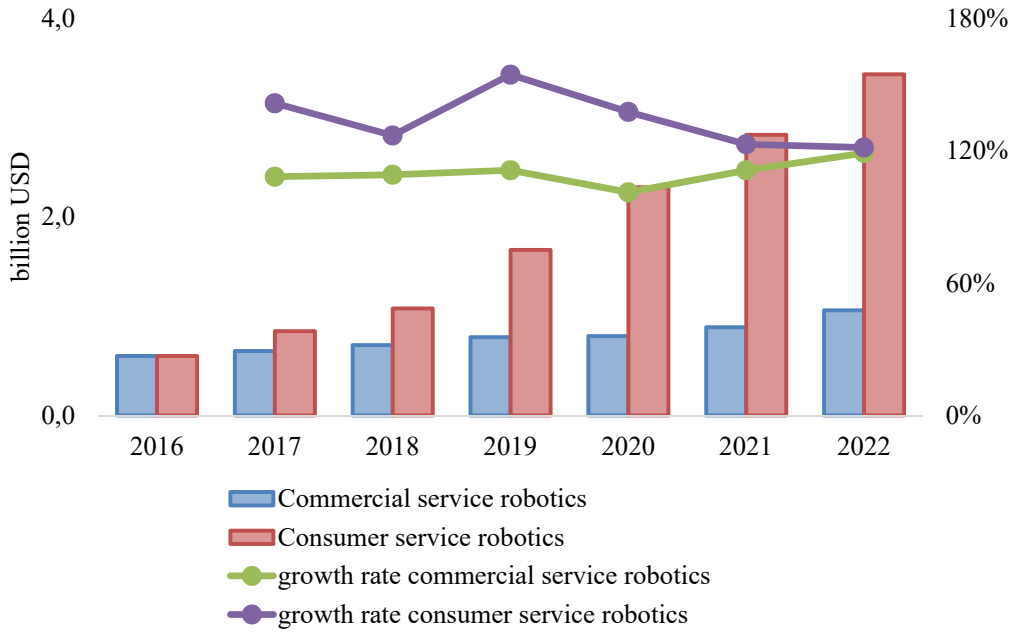

Figure 12. Volume and dynamics of the service robotics industry segment in the USA 2016–2022, billion US dollars

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Analysis of the service robotics market in China

Looking at the number of installations of service robots in China, a steady growth of 13 % can be seen, indicating an increasing demand for service robots in China (Figure 13). This situation will certainly lead to an increase in the volume of the market itself, opening up new opportunities for China in this segment (Chi et al., 2023).

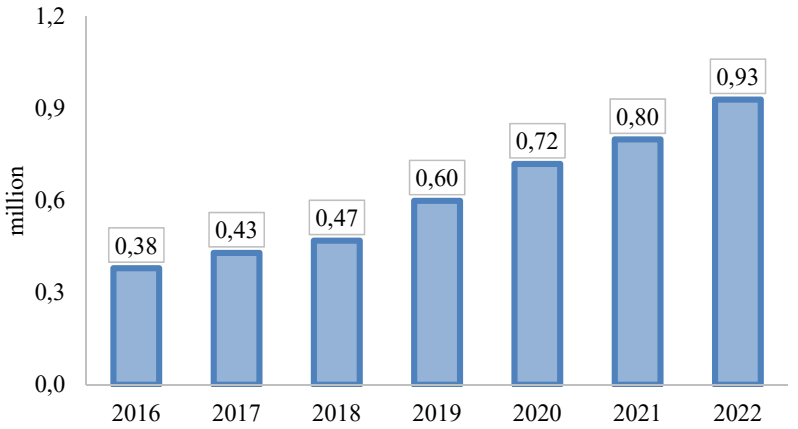

Figure 13. Number of new installations of service robots in China 2016–2022, mln

Source: compiled by the authors based on IFR report: International Federation of Robotics. Retrieved September 9, 2023, from https://ifr.org/ifr-press-releases/news/robot-sales-rise-again

Analyzing the volume and dynamics of revenue from the service robotics segments, we see that the consumer service segment generates the most income, while commercial service robotics is less profitable. However, it should be noted that the growth rate of consumer service robotics is gradually decreasing, in contrast to commercial service, the growth rate of which has been positive since 2020. Thus, the service robotics market is a promising development direction for China. One of the market growth areas is the development of smart cities in China, as well as projects in the healthcare sector (Yu et al., 2023; Reshetnikova et al., 2021). Thanks to the support of the Government, as well as the systematic demand for service robots in the implementation of these projects, service robotics in China will be able to reach a new level.

Factors influencing the development of robotics

The amount of money invested in the robotics technology sector is one of the primary factors driving the robotics market's growth. The US is making significant investments in science, particularly robotics advancement. As a result, almost 40 % of global R&D investment comes from the US; interestingly, the US investment growth rate follows the global trend.

Examining the government's projects in greater detail allows us to identify a number of initiatives, such as:

1. The goal of the DARPA Robotics Challenge program is to create rescue robots that can function in harsh environments, like earthquakes and other calamities (Chung et al., 2023).
2. The NASA Aeronautics Research Mission Directorate program, which carries out studies on unmanned aerial vehicles.
3. The National Robotics Initiative seeks to promote robotics research and development across a range of domains, including industry and medical (Yip et al., 2023).

4. The Advanced Manufacturing Partnership initiative, which focuses on creating new manufacturing technologies, such as robotic systems for process automation (Sunley et al., 2023).

Furthermore, to revive the nation's production of chips and electronic systems, the federal government is investing in businesses, offering tax breaks, assisting with the building of factories, and other measures that will catapult the robotics sector in the United States to unprecedented heights (Isik et al., 2023).

These and other robotics initiatives foster education, commercialization, and innovation in the US robotics industry. It is important to note that several prestigious US colleges, including Stanford, MIT, and Carnegie Mellon, also fund their robotics research projects with government money.

One of the main things affecting the growth of the robotics sector is high-quality education. The US government has boosted annual investments on public schooling over the past 20 years, making the country's educational system among the most advanced in the world. Numerous academic institutions provide robotics curricula that provide students with the necessary knowledge and abilities to pursue careers in the industry (Darmawansah et al., 2023).

The development of the robotics industry is also influenced by factors such as cloud computing and 5G networks; ESG, as well as active robotization of production (Asif et al., 2023); development of the electric automotive industry. Why does the industry need each of these factors?

5G is a generation of mobile Internet with much higher bandwidth. Latency is one of the main concerns of robotics developers as it greatly limits robots. However, it is a reliable mobile network that can make it possible to introduce artificial intelligence into robots, so the robot will navigate much better in space and carry out any activity without special programming (Ness et al., 2023). In general, the development of robotics as an industry is influenced by the telecommunications sector, since the availability of the Internet, the number of cellular subscribers, etc. provide the infrastructure necessary for the functioning of the industry. Thus, over the past 20 years, the average Internet connection speed in the United States has been growing, just as international Internet bandwidth has been increasing.

As a result, the US government is actively encouraging the growth of the robotics sector. It builds the infrastructure required for the industry to operate, enacts legislation that facilitates business dealings in the region by lowering taxes, for example, actively invests in education and research and development, and establishes unique government initiatives to support the industry's growth.

Factors influencing robotics industry in China

China is actively investing in R&D, which amounts to about 30 % of the global volume; it should also be noted that the volume of investments is growing annually.

Also, one of the fundamental factors influencing the development of knowledge-intensive industries, including robotics, is the number of patents in the industry

(Santarelli et al., 2023). Chinese companies such as Huawei, Tencent, Alibaba and others regularly occupy leading positions in the number of patents in technology fields.

In China, government programs have an even greater impact on the development of the industry. Thus, among the most famous programs developing robotics in the country are:

- "Made in China 2025" is an initiative pursuing the goal of developing high-tech industries, including robotics, so by the end of 2025 China aims to cover 70 % of the domestic market with domestic developments, including intellectual property rights, and also that domestic companies creating robots enter the top 5 best in the world (Karabegović et al., 2023);
- "New Generation Artificial Intelligence Development Plan" — a project to create an artificial intelligence industry by 2030 so that China begins to lead in this area (Reshetnikova & Mikhaylov, 2023);
- The "One Belt — One Road" initiative, a project aimed at creating a global infrastructure to strengthen economic ties between countries, partially affects robotics specifically in the field of infrastructure solutions (Westphal & Wang, 2023);
- Creation of demonstration zones — cities, which also include robotic systems, among such cities are: Chengdu, Shenzhen and Hangzhou (Lin et al., 2023);

As a result, government initiatives and investments are among the main drivers of the Chinese robot industry's growth. In addition, the industry's overall growth will have an impact on the sector's development, so the expansion of the Chinese economy naturally contributes to the sector's proliferation.

Conclusion

Based on the research, we can say that the robotics industry is dynamically developing, promising and profitable, and the USA and China are the main players in this market, shaping it, leading it, creating trends and tendencies. As a result, we can say that at the moment the USA and China have occupied their niches. China leads the market for industrial robots, while the United States leads the market for service robots. Both countries invest in the development of the industry, develop government programs that support it, and create infrastructure that facilitates its development.

In conclusion, we would like to note that the situation in the robotics market is not stable, because this is a high-precision industry, much in its development will depend on the further policies of states, TNCs, the spread of the Internet and research in this industry, therefore our main task in further research is monitoring market dynamics in these countries.

References

Asif, M., Searcy, C., & Castka, P. (2023). ESG and Industry 5.0: The role of technologies in enhancing ESG disclosure. *Technological Forecasting and Social Change*, *195*, 122806. https://doi.org/10.1016/j.techfore.2023.122806

Čapek, K. (2023). *RUR (Rossum's Universal Robots): A Fantastic Melodrama in Three Acts and an Epilogue*. Good Press.

Cheng, H., Jia, R., Li, D., & Li, H. (2019). The rise of robots in China. *Journal of Economic Perspectives*, *33*(2), 71–88. https://doi.org/10.1257/jep.33.2.71

Chi, O.H., Chi, C.G., Gursoy, D., & Nunkoo, R. (2023). Customers' acceptance of artificially intelligent service robots: The influence of trust and culture. *International Journal of Information Management*, *70*, 102623. https://doi.org/10.1016/j.ijinfomgt.2023.102623

Christensen, H., Amato, N., Yanco, H., Mataric, M., Choset, H., Drobnis, A., Goldberg, K., Grizzle, J., Hager, G., Hollerbach, J., Hutchinson, S., Krovi, V., Lee, D., Smart, W.D., Trinkle J., & Sukhatme, G. (2021). A roadmap for us robotics–from internet to robotics 2020 edition. *Foundations and Trends® in Robotics*, *8*(4), 307–424. http://dx.doi.org/10.1561/2300000066.

Chung, T.H., Orekhov, V., & Maio, A. (2023). Into the Robotic Depths: Analysis and Insights from the DARPA Subterranean Challenge. *Annual Review of Control, Robotics, and Autonomous Systems*, *6*, 477–502. https://doi.org/10.1146/annurev-control-062722-100728

Darmawansah, D., Hwang, G.J., Chen, M.R., A., & Liang, J.C. (2023). Trends and research foci of robotics-based STEM education: a systematic review from diverse angles based on the technology-based learning model. *International Journal of STEM Education*, *10*(1), 1–24. https://doi.org/10.1186/s40594-023-00400-3

Feenstra, R.C., & Sasahara, A. (2018). The 'China shock,'exports and US employment: A global input–output analysis. *Review of International Economics*, *26*(5), 1053–1083. https://doi.org/10.1111/roie.12370

Gonzalez-Aguirre, J.A., Osorio-Oliveros, R., Rodríguez-Hernández, K.L., Lizárraga-Iturralde, J., Morales Menendez, R., Ramírez-Mendoza, R.A., Ramírez-Moreno, M.A., Lozoya-Santos, J.d.J. (2021). Service robots: Trends and technology. *Applied Sciences, 11*(22), 10702. https://doi.org/10.3390/app112210702

Hägele, M., Nilsson, K., Pires, J.N., & Bischoff, R. (2016). Industrial robotics. *Springer handbook of robotics*, 1385–1422. https://doi.org/10.1007/978-3-319-32552-1_54

Isik, O., K. Inadagbo, Y. Bulbul, M. Isik, & C. Dikmen. "International Chip Crisis: Country Approaches." *Proceedings of IConSES* (2023).

Karabegović, I., Husak, E., Karabegović, E., & Mahmić, M. (2023, May). Robotic Technology as the Basis of Implementation of Industry 4.0 in Production Processes in China. In *International Conference "New Technologies, Development and Applications"* (pp. 3–18). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-31066-9_1

Lin, Y., Hu, W., Chen, X., Li, S., & Wang, F.Y. (2023). City 5.0: Towards spatial symbiotic intelligence via DAOs and parallel systems. *IEEE Transactions on Intelligent Vehicles.* https://doi.org/10.1109/TIV.2023.3298903

Merdin-Uygur, E., & Ozturkcan, S. (2023). Consumers and service robots: Power relationships amid COVID-19 pandemic. *Journal of Retailing and Consumer Services*, *70*, 103174. https://doi.org/10.1016/j.jretconser.2022.103174

Montgomery, E.B., & Yoshihara, T. (2022). The Real Challenge of China's Nuclear Modernization. *The Washington Quarterly*, *45*(4), 45–60. https://doi.org/10.1080/0163660X.2022.2148508

Ness, S., Shepherd, N.J., & Xuan, T.R. (2023). Synergy Between AI and Robotics: A Comprehensive Integration. *Asian Journal of Research in Computer Science, 16*(4), 80–94. https://doi.org/10.9734/ajrcos/2023/v16i4372

Reshetnikova, M.S., Vasileva, G.A., & Tretiakova, S.S. (2021). China's place in the global smart city market. *Voprosy innovatsionnoy ekonomiki, 11*(4), 1997–2018. (In Russ.). https:10.18334/vinec. 11.4.113971.

Reshetnikova, M.S., & Mikhaylov, I.A. (2023). Artificial Intelligence Development: Implications for China. *Montenegrin Journal of Economics*, *19*(1), 139–152. https://doi.org/10.14254/1800-5845/2023.19-1.12

Reshetnikova, M.S., & Pugacheva, I.A. (2022). The Global Industrial Robotics Market: Development Trends and Volume Forecast. In *Current Problems of the World Economy and International Trade* (pp. 187–195). Emerald Publishing Limited. https://doi.org/10.1108/S0190-128120220000042018

Reshetnikova, M.S. (2020). China's AI experience: Industrial digitalization. *RUDN Journal of Economics, 28*(3), 536–546. (In Russ.). http://dx.doi.org/10.22363/2313-2329-2020-283-536-546.

Santarelli, E., Staccioli, J., & Vivarelli, M. (2023). Automation and related technologies: a mapping of the new knowledge base. *The Journal of Technology Transfer, 48*(2), 779–813. https://doi.org/10.1007/s10961-021-09914-w

Sunley, P., Evenhuis, E., Harris, J., Harris, R., Martin, R., & Pike, A. (2023). Renewing industrial regions? Advanced manufacturing and industrial policy in Britain. *Regional Studies*, *57*(6), 1126–1140. https://doi.org/10.1080/00343404.2021.1983163

Westphal, T., & Wang, R. (2023). Artificial intelligence with Chinese characteristics: national strategy, security and authoritarian governance. *International Affairs, 99*(1), 410–411. https://doi.org/10.1093/ia/iiac269

Yip, M., Salcudean, S., Goldberg, K., Althoefer, K., Menciassi, A., Opfermann, J.D., …, & Lee, I.C. (2023). Artificial intelligence meets medical robotics. *Science*, *381*(6654), 141–146. https://doi.org/10.1126/science.adj3312

Yu, L., Wang, Y., Wei, X., & Zeng, C. (2023). Towards low-carbon development: The role of industrial robots in decarbonization in Chinese cities. *Journal of Environmental Management*, *330*, 117216. https://doi.org/10.1016/j.jenvman.2023.117216

Zhao, M. (2019). Is a new Cold War inevitable? Chinese perspectives on US–China strategic competition. *The Chinese Journal of International Politics*, *12*(3), 371–394. https://doi.org/10.1093/cjip/poz010

Bio notes / Сведения об авторах

Marina S. Reshetnikova, PhD, Assistant Professor of Department of Economic and Mathematical Modeling, Peoples' Friendship University of Russia (RUDN University). ORCID: 0000-0003-2779-5838. E-mail: reshetnikova-ms@rudn.ru

Решетникова Марина Сергеевна, кандидат экономических наук, доцент кафедры экономико-математического моделирования, Российский университет дружбы народов. ORCID: 0000-0003-2779-5838. E-mail: reshetnikova-ms@rudn.ru

Svetlana S. Tretyakova, student, Faculty of Economics, Peoples' Friendship University of Russia (RUDN University). E-mail: 1032201952@rudn.ru

Третьякова Светлана Сергеевна, студент, экономический факультет, Российский университет дружбы народов. E-mail: 1032201952@rudn.ru